 doi 10.3969/j.issn.1673-4254.2015.04.14 J South Med Univ, 2015, 35(4): 536-539

临床研究

偏侧咀嚼干预治疗改善咬肌活动不对称性的肌电分析

王 云[1],滕 琛[1,2],汪萌芽[3]
[1]皖南医学院口腔正畸研究室,[2]芜湖市口腔医院,[3]皖南医学院细胞电生理研究室,安徽 芜湖 241002

摘要:目的 运用咬肌肌电图分析偏侧咀嚼干预的效果。 **方法** 43例患者(男19人,女24人,平均年龄20.0±0.5岁)根据有无诱因和是否干预分为4组:去诱因不干预组(A_0)、去诱因干预组(A_1)、无诱因不干预组(B_0)和无诱因干预组(B_1)。用肌电图仪分别记录各组前后在下颌姿势位(MPP)、牙尖交错位(ICP)最大紧咬运动和咀嚼运动时的咬肌肌电图,计算咬肌的活动不对称指数(ASMM),分析比较各组前后咬肌肌电活动的变化。 **结果** (1)A_0组在MPP、ICP最大紧咬运动和咀嚼运动中ASMM去诱因前后差异均无统计学意义;(2)A_1组干预后在MPP、ICP最大紧咬运动和咀嚼运动中ASMM显著低于干预前;(3)B_0组在咀嚼运动中实验前后差异有统计学意义;(4)B_1组干预后在MPP、ICP最大紧咬运动和咀嚼运动中ASMM较干预前显著降低。 **结论** 偏侧咀嚼无论有无诱因均应干预治疗,有诱因则在诱因去除后进行。
关键词:偏侧咀嚼;干预治疗;肌电图;咬肌

Changes of masseter muscle asymmetry due to unilateral mastication after intervention: a electromyographic analysis

WANG Yun[1], TENG Chen[1,2], WANG Mengya[3]
[1]Department of Orthodontics of Wannan Medical College, [2]Stomatological Hospital of Wuhu City, [3]Cell Electrophysiology Laboratory of Wannan Medical College, Wuhu 241002, China

Abstract: Objective To explore the effect of intervention with unilateral mastication on masseter muscle asymmetry. **Methods** Forty-three subjects (19 males and 24 females, mean age 20.0±0.5 years) with unilateral chewing were divided into group A_0 with motivation and without intervention, group A_1 with motivation and intervention, group B_0 without motivation or intervention, and group B_1 without motivation but with intervention. In groups A_0 and A_1, the motivation was removed and groups A_1 and group B_1 received interventions. Surface electromyography was recorded using surface electromyography in all the subjects in mandible postural position (MPP), with maximum clenching in intercuspal position (ICP) and during chewing. The sEMG of the left and right masseter muscle were separately recorded to assess the asymmetry index of the masseter muscles (ASMM) and its changes after intervention. **Results** In groupA_0, the ASMM at MPP, during maximum clenching and chewing had no obvious changes after removal of the motivation. In group A_1, the ASMM at MPP, during maximum clenching and chewing were obviously decreased after intervention. In group B_0, the ASMM at MPP and during maximum clenching showed no obvious changes but ASMM during chewing significantly increased after removal of the motivation. In group B_1, the ASMM at MPP, during maximum clenching and chewing all decreased obviously after intervention. **Conclusion** Interventions can significantly improve the bilateral symmetry of the masseter muscles in subjects with unilateral chewing, and the motivation for unilateral chewing should be removed before intervention.
Key words: unilateral mastication; intervention; surface electromyography; masseter muscles

偏侧咀嚼在人群中发生率较高,患者一般意识不到这种不良咀嚼习惯及其危害性,但目前正逐渐为医师所重视[1-2]。Barcellos 等[3]对300例样本的调查发现乳牙期、替牙期及恒牙期的偏侧咀嚼发生率分别为87%、82%、76%。Nakayama 等[4]调查了114名口腔卫生保健专业的女大学生,发现偏侧咀嚼是颞颌关节功能紊乱的首要因素。目前认为其主要原因有被动偏侧咀嚼(牙列一侧有龋齿、牙齿缺失、咬合紊乱等诱发因素引起)以及只是一种咀嚼习惯[5],且有这种习惯的人群患龋率较正常咀嚼人群高[6]。治疗手段主要是去除诱因,但临床发现:相当一部分有明确诱因的患者,并未在去诱因后就自然地逐渐恢复为双侧咀嚼[7]。有关偏侧咀嚼患者是否需要进行干预治疗国内外少见报道,本文对偏侧咀嚼无论有无诱因(有诱因需去除),应用肌电图对干预和不干预治疗前后的面部两侧咬肌活动不对称指数改变情况进行分析,以明确偏侧咀嚼是否需要干预治疗,并为这一不良咀嚼习惯的矫正提供新的思路和方法。

收稿日期:2014-12-19
基金项目:国家自然科学基金(31271155);皖南医学院重点培育基金(wk2013Z09)
Supported by National Natural Science Foundation of China (31271155).
作者简介:王 云,硕士,副教授,副主任医师, E-mail: whwy303@hotmail.com
通信作者:汪萌芽,博士,教授,E-mail: wangmy@wnmc.edu.cn

1 对象与方法

1.1 研究对象

经皖南医学院伦理委员会审查,本研究的内容和过程遵循国际及国家颁布的有关生物医学研究的伦理要求。采用整群抽样的方法对皖南医学院口腔医学专业2010~2011级在校本科生进行口腔检查。采集偏侧咀嚼者43人,男19人,女24人,平均20.0±0.5岁。样本纳入标准:主诉偏侧咀嚼3个月以上;废用侧上下后牙有明显的软垢、牙结石、牙龈炎或牙周病;无提示情况下咀嚼口香糖,观察咀嚼运动为单侧咀嚼。符合以上任一指标都可纳入研究样本。所有受试者签订知情同意书。

1.2 测试仪器

肌电信号的采集采用蓝点电极片(型号:N-00-S,丹麦Ambu公司生产),用PowerLab 8/30八通道多用途生理记录仪(澳大利亚AD Instruments公司)采集、放大、滤波、输出,进行数字化显示和储存。

1.3 样本分组及干预

1.3.1 根据有无诱因(龋病、牙列缺损、错牙合干扰等)分组 (1)根据有无诱因进行分组:A组:有诱因组(n=13);B组:无诱因组(n=30)。A组:去诱因治疗,主要包括牙周病治疗、龋齿治疗、义齿修复、口腔正畸治疗、调𬌗等。(2)诱因去除后对A、B组分别再随机分组,并行咬肌肌电检测:A_0-去诱因不干预组(n=3);A_1-去诱因干预组(n=10);B_0-无诱因不不干预组(n=18);B_1-无诱因干预组(n=12)。

1.3.2 A_1组和B_1组的干预 (1)认知行为干预:让受试者明确认识到偏侧咀嚼危害性,从而主动改善自身不良咀嚼方式;(2)行为干预:进食时,主动学习废用侧咀嚼从而达到双侧咀嚼;每天3餐后有意识用废用侧嚼口香糖20~30 min;(3)6个月后分别对以上4组再进行咬肌电检查。

1.4 咬肌肌电检测方法和步骤

让受试者熟练掌握下颌姿势位、紧咬运动与咀嚼运动动作。用75%乙醇棉球擦拭测试部位皮肤,干燥后将记录电极固定于双侧咬肌(左侧咬肌,LMM;右侧咬肌,RMM)的表面(肌纤维收缩最明显处)。前额正中贴放接地电极。记录电极与参照电极相距15~20 mm。嘱受试者端坐,全身放松,不咀嚼不说话,两眼平视,上下牙自然分开,休息3 min,按指导完成下列动作,检测在屏蔽室内进行。(1)下颌姿势位(MPP):记录其肌电图20 s;(2)牙尖交错位(ICP)最大紧咬:嘱受试者从MPP开始,闭口于ICP至上下牙最大紧咬。记录肌电图10 s,然后放松恢复至MPP,动作重复3次,每次间隔5 s;(3)咀嚼运动:让受试者咀嚼口香糖,不粘牙后将口香糖置于舌中央,从ICP开始在双侧磨牙区自由咀嚼。记录其肌电图20 s。

1.5 肌电数据计算和统计

咬肌活动不对称性指数(Asymmetry index of masseter muscles, ASMM)=(RMM-LMM)/(RMM+LMM)×100%,其中LMM和RMM分别为左侧和右侧咬肌平均峰值电位。应用"Origin 5.0软件进行统计分析,计量资料以均数±标准差表示,各组间均数比较采用t检验。

2 结果

2.1 去诱因不干预组(A_0)去诱因前后ASMM的比较

A_0组在MPP、ICP紧咬和咀嚼运动中ASMM去诱因前后差异均无统计学意义(表1,咬肌在ICP最大紧咬和咀嚼运动时的典型肌电图见图1,2),提示仅仅去诱因,去诱因前后两次测试咬肌活动对称性无明显变化。

表1 去诱因不干预组(A_0)前后ASMM的比较

Tab.1 ASMM analysis of group A_0 (*Mean±SD*)

Group	n	MPP	Maximum teeth clenching in ICP	Masticatory movement
Before test	3	12.49±11.35	15.93±5.68	16.78±10.75
After test	3	5.04±3.51	21.56±9.49	18.81±2.32
t		1.087	-0.882	-0.321
P		0. 338	0.428	0.764

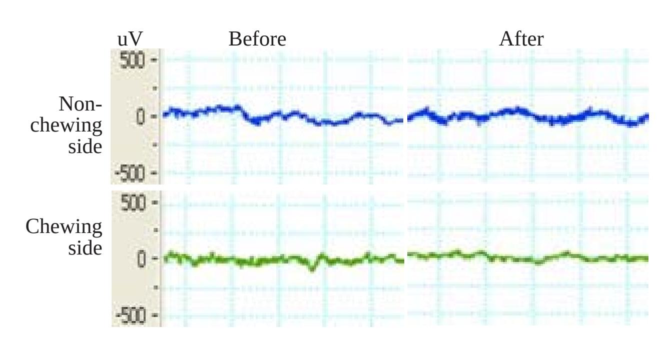


图1 A_0组实验前后ICP紧咬运动时咬肌肌电图的比较

Fig.1 EMG of the masseter muscles during the maximum teeth clenching in ICP before and after the tests in A_0 group.

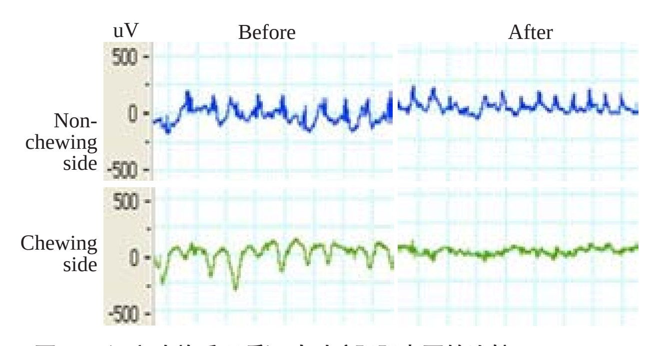


图2 A_0组实验前后咀嚼运动时咬肌肌电图的比较

Fig.2 EMG of masseter muscles during the masticatory movement before and after the tests in A_0 group.

2.2 去诱因干预组(A_1)干预前后ASMM指数的比较

A_1组干预后在MPP、ICP紧咬和咀嚼运动中ASMM低于干预前,且差异具有统计学意义(表2),提示去诱因后进行干预,干预后咬肌活动对称性明显改善。

A_1组典型病例:刘某,女,21岁。主诉5年以上偏侧咀嚼。口腔检查:牙列完整,后牙中性关系,$\frac{2|}{32|}$反𬌗。处

理:去诱因治疗(正畸治疗约1年时间)并进行不良习惯干预。本病例从其去诱因及干预前后的正面相对比中,可以观察到去诱因及干预后,此患者面部不对称亦有所改善。对其咬肌在ICP最大紧咬和咀嚼运动时的肌电图进行对比(图3、4)发现其废用侧咬肌功能有所恢复,两侧咬肌的协调对称性明显改善。

表2 去诱因干预组(A_1)干预前后ASMM的比较

Tab.2 ASMM analysis of group A_1 (*Mean±SD*)

Group	*n*	MPP	Maximum teeth clenching in ICP	Masticatory movement
Before test	10	15.58±12.39	33.10±22.85	31.25±12.30
After test	10	6.17±6.36	13.52±14.59	12.37±7.20
t		2.138	2.284	4.188
P		0.046*	0.035*	0.001**

$^*P<0.05$, $^{**}P<0.01$.

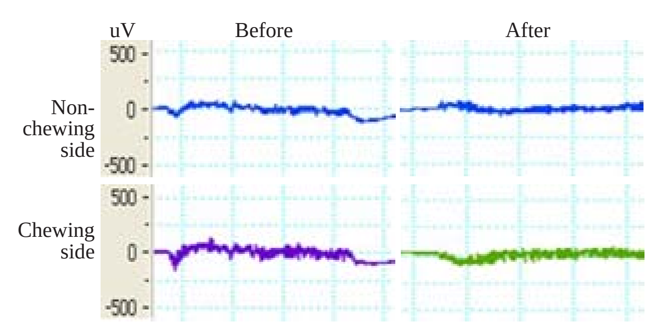


图3 A_1组干预前后ICP紧咬运动时咬肌肌电图的比较

Fig.3 EMG of masseter muscles during the maximum teeth clenching in ICP before and after the tests of in A_1 group.

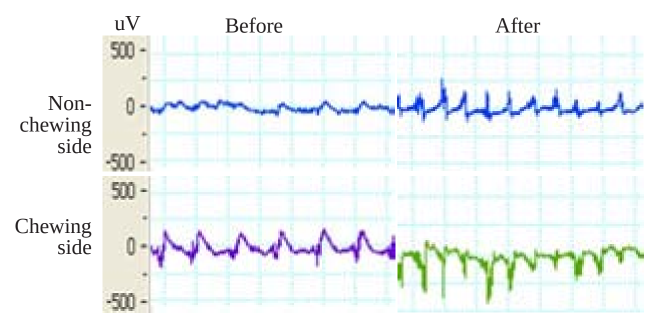


图4 A_1组干预前后咀嚼运动时咬肌肌电图的比较

Fig.4 EMG of masseter muscles during the masticatory movement before and after the tests in A_1 group.

2.3 无诱因不干预组(B_0)前后ASMM的比较

B_0组在MPP和ICP紧咬运动中ASMM前后差异无统计学意义(表3,咬肌在ICP最大紧咬和咀嚼运动时的典型肌电图见图5和图6),但咀嚼运动中ASMM前后差异具有统计学意义,提示无诱因偏侧咀嚼不行干预组,在咀嚼运动中咬肌活动不对称性有加剧趋势。

2.4 无诱因干预组(B_1)前后ASMM的比较

B_1组干预后在MPP、ICP紧咬运动和咀嚼运动中ASMM较干预前降低,且差异具有统计学意义(表4,咬肌在ICP最大紧咬和咀嚼运动时的典型肌电图见图7和图8),提示无诱因干预组干预后咬肌活动对称性有所改善。

表3 无诱因不干预组(B_0)前后ASMM的比较

Tab.3 ASMM analysis of group B_0 (*Mean±SD*)

Group	*n*	MPP	Maximum teeth clenching in ICP	Masticatory movement
Before test	18	15.50±12.29	26.29±14.91	21.47±7.15
After test	18	15.47±8.35	26.33±14.75	27.54±10.18
t		0.007	-0.009	-2.070
P		0.994	0.993	0.046*

$^*P<0.05$.

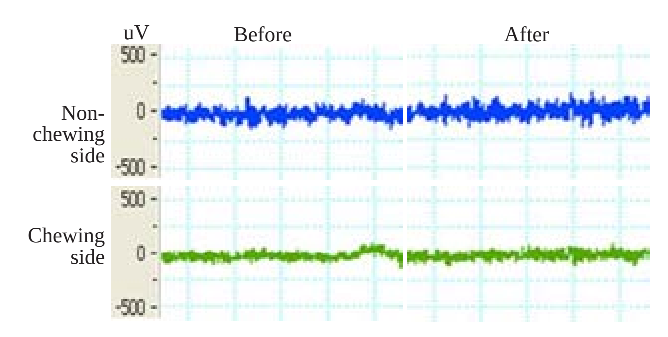


图5 B_0组实验前后ICP紧咬运动时咬肌肌电图的比较

Fig.5 EMG of masseter muscles during the maximum teeth clenching in ICP before and after the tests in B_0 group.



图6 B_0组实验前后咀嚼运动时咬肌肌电图的比较

Fig.6 EMG of masseter muscles during the masticatory movement before and after the tests in B_0 group.

3 讨论

偏侧咀嚼是一种常用单侧牙列咀嚼的口腔不良习惯,长期偏侧咀嚼会导致口颌系统功能紊乱及面部不对称[7-8]。尽管长期偏侧咀嚼引起的后果甚为严重,但临床上患者一般不会主诉偏侧咀嚼就诊,常常是在治疗可能继发于这一习惯的其他疾病,如发展到一定阶段导致废用侧磨牙中、重度牙周病,颜面左右不对称,以及出现颞颌关节症状时被发现。发现后,也只是针对引起这一不良咀嚼习惯的诱因和继发疾病进行治疗,如治疗废用侧龋齿、修复缺失的牙齿、正畸治疗不良的咬合关系等,同时认为治疗后,患者就能自然地恢复为双侧咀嚼。然而临床实际观察到的情况并非如此。Diernberger等[7]调查也发现一侧牙齿缺失导致偏侧咀嚼,修复缺失牙齿后患者并未恢复为双侧咀嚼。因此本研究对受试者进行认知和行为干预,结果表明无论有无诱因,干预较不干

表4 无诱因干预组(B_1)前后ASMM的比较
Tab.4 ASMM analysis of group B_1 (*Mean±SD*)

Group	*n*	MPP	Maximum teeth clenching in ICP	Masticatory movement
Before test	12	15.73±12.39	32.85±16.15	29.89±23.87
After test	12	2.68±1.85	3.51±4.15	5.05±5.17
t		3.609	6.095	3.522
P		0.002**	0.000**	0.002**

*P<0.05, **P<0.01.

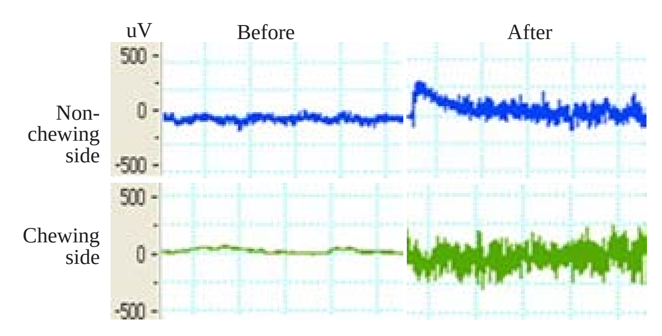


图7 B_1组干预前后ICP紧咬运动时咬肌肌电图的比较
Fig.7 EMG of masseter muscles during the maximum teeth clenching in ICP before and after the tests in B_1 group.

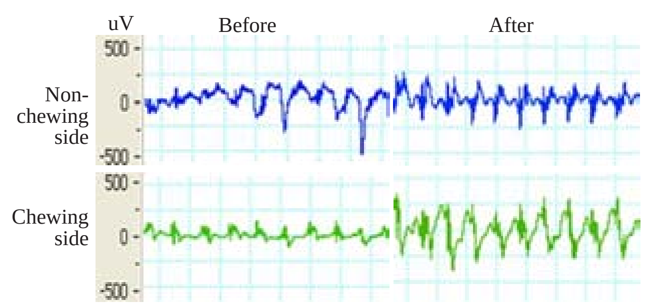


图8 B_1组干预前后咀嚼运动时咬肌肌电图的比较
Fig.8 EMG of masseter muscles during the masticatory movement before and after the tests in B_1 group.

预组均表现为双侧咬肌活动的协调性增加，功能改善；研究还发现无诱因不干预组在咀嚼运动中咬肌活动不对称指数显著增加，提示其咬肌活动不对称性越来越严重，表明本实验进行的认知和行为干预治疗对偏侧咀嚼有一定的改善作用。Maffei等[9]运用肌电图对儿童由于一侧后牙骨性反𬌗引起的偏侧咀嚼进行研究，结果表明在完成正畸治疗后需结合肌功能训练才能使面部两侧肌电活动一致，支持本研究的结果。

肌电图是评价肌功能的客观指标之一，也是检查咀嚼运动中两侧咬肌是否对称的一个有效的方法[10-11]。Tecco等[12]对高加索成年女性的头颅侧位片和头、颈、躯干的表面肌电图进行了相关性研究，提出咀嚼肌的表面肌电图能够间接反映面部形态。本研究通过对偏侧咀嚼习惯受试者有无干预前后咬肌肌电活动不对称指数的分析，评价干预性效果有一定的理论和实验依据。

咀嚼活动与其相关结构间存在明显的相互作用，异常的结构会导致不良的咀嚼运动，而咀嚼功能的异常又会导致或加重结构的变异[1, 13-14]。本研究去诱因干预组典型患者由于处于发育停滞阶段，面部不对称(硬组织不对称引起)通过去诱因和不良咀嚼习惯的干预不能得到完全改善，提示对于偏侧咀嚼不仅应从结构和功能双方进行治疗或干预，同时还要做到早发现早干预，才能真正打断这种恶性循环，获得有效治疗效果。

参考文献：

[1] Ratnasari A, Hasegawa K, Oki K, et al. Manifestation of preferred chewing side for hard food on TMJ disc displacement side[J]. J Oral Rehabil, 2011, 38(1): 12-7.
[2] Lamontagne P, Al-Tarakemah Y, Honkala E. Relationship between the preferred chewing side and the angulation of anterior tooth guidance[J]. Med Princ Pract, 2013, 22: 545-9.
[3] Barcellos DC, Gonçalves SE, Da Silva MA, et al. Prevalence of chewing side preference in the deciduous, mixed and permanent dentitions[J]. J Contemp Dent Pract, 2012, 12(5): 339-42.
[4] Nakayama R, Nishiyama A, Kino K, et al. Influence of contributing factors in temporomandibular disorders in female college students [J]. Kokubyo Gakkai Zasshi, 2013, 80(2): 62-7.
[5] 魏翠芹. 偏侧咀嚼的病因以及危害认知调查分析[J]. 中国疗养医学, 2011, 20(6): 562.
[6] 毛梦莹, 周玉乔, 陈谦明, 等. 习惯性偏侧咀嚼与龋病相关性调查[J]. 现代预防医学, 2013, 40(5): 848-9.
[7] Diernberger S, Bernhardt O, Schwahn C, et al. Self-reported chewing side preference and its associations with occlusal, temporomandibular and prosthodontic factors: results from the population-based Study of Health in Pomerania (SHIP-0) [J]. J Oral Rehabil, 2008, 35(8): 613-20.
[8] 王子娴, 徐龙博, 祁 冬, 等. 偏侧咀嚼致咀嚼肌功能紊乱发病机制的研究[J]. 华西口腔医学杂志, 2011, 29(1): 96-9.
[9] Maffei C, Garcia P, De Biase NG, et al. Orthodontic intervention combined with myofunctional therapy increases electromyographic activity of masticatory muscles in patients with skeletal unilateral posterior crossbite[J]. Acta Odontol Scand, 2014, 72(4): 298-303.
[10] Hugger A, Hugger S, Schindler HJ. Surface electromyography of the masticatory muscles for application in dental practice. Current evidence and future developments[J]. Int J Comput Dent, 2008, 11 (2): 81-106.
[11] Alajbeg IP, Alajbeg I, illes D. influence of occlusal stabilization splint on the asymmetric activity of masticatory muscles in patients with temporomandibular dysfunction [J]. Coll Antropol, 2003, 27 (1): 361-71.
[12] Tecco S, Criincoli V, Di Bisceglie B, et al. Relation between facial morphology on lateral skull radiographs and sEMG activity of head, neck, and trunk muscles in Caucasian adult females [J]. J Electromyogr Kinesiol, 2011, 21(2): 298-310.
[13] Panagiotopoulou O, Cobb SN. The mechanical significance of morphological variation in the macaque mandibular symphysis during mastication[J]. Am J Phys Anthropol, 2011, 146(2): 253-61.
[14] Weber P, Corrêa EC, Bolzan Gde P, et al. Chewing and swallowing in young women with temporomandibular disorder [J]. CoDAS, 2013, 25(4): 375-80.

(编辑：黄开颜)